# Restoration of Bighorn Sheep to Hells Canyon:
# The Hells Canyon Initiative





By the Hells Canyon Restoration Committee

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# RESTORATION OF BIGHORN SHEEP TO HELLS CANYON

## *THE HELLS CANYON INITIATIVE*

Idaho Department of Fish and Game

Oregon Department of Fish and Wildlife

Washington Department of Fish and Wildlife

U.S. Forest Service

Bureau of Land Management

Foundation for North American Wild Sheep

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Cover photographs by Tim Schommer, Bill Loftus, and Vic Coggins

## LIST OF AUTHORS

The Hells Canyon Bighorn Sheep Restoration Plan was prepared by the Hells Canyon Bighorn Sheep Restoration Committee. Committee members are:


Frances Cassirer, Idaho Department of Fish and Game, Wildlife Research Biologist, Hells Canyon Bighorn Sheep Restoration Project Coordinator

John Beecham, Idaho Department of Fish and Game, Wildlife Game Manager

Vic Coggins, Oregon Department of Fish and Wildlife, District Wildlife Biologist

Don Whittaker, Oregon Department of Fish and Wildlife, Program Coordinator

Pat Fowler, Washington Department of Fish and Wildlife, District Wildlife Biologist

Rolf Johnson, Washington Department of Fish and Wildlife, Big Game Program Manager

Kevin Martin, U.S. Forest Service, Zone Biologist, Hells Canyon National Recreation Area/Wallowa Valley Ranger District

Tim Schommer, U.S. Forest Service, Forest Biologist, Wallowa-Whitman National Forest

ElRoy Taylor, Bureau of Land Management, Wildlife Biologist

Allan Thomas, Bureau of Land Management, Idaho State Biologist

Duncan Gilchrist, Foundation for North American Wild Sheep, Secretary

Lloyd Oldenburg, Foundation for North American Wild Sheep


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## SUMMARY

The Hells Canyon Initiative is a state, federal, and private partnership to restore Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) in the Hells Canyon area of Oregon, Idaho, and Washington. This plan describes project goals and objectives, the background and current condition of bighorn sheep and bighorn sheep management in Hells Canyon, and actions to be accomplished under the Hells Canyon Initiative. The plan was written by and will be implemented by the Hells Canyon Bighorn Sheep Restoration Committee, a committee operating under a Memorandum of Agreement signed by the states of Oregon, Idaho, and Washington, the Wallowa-Whitman National Forest, the Bureau of Land Management, and the Foundation for North American Wild Sheep.

The Hells Canyon project area encompasses over 5.5 million acres in the Snake River drainage from the mouth of the Clearwater River, Idaho south to Brownlee Reservoir. Elevations range from 800 ft in the Snake River Canyon to over 9,000 ft in the Seven Devils, Idaho and Wallowa Mountains, Oregon. Over 1.3 million acres (24%) of the project area is potential bighorn sheep habitat, 68% of which is publicly-owned, primarily managed by the U.S. Forest Service. Other public land managers are the states of Idaho, Oregon, and Washington and the Bureau of Land Management.

Bighorn sheep were historically abundant, but were extirpated from Hells Canyon and the surrounding area by 1945 by a combination of competition for forage with domestic livestock, introduced diseases, and over hunting. Bighorn sheep reintroductions and habitat management have been ongoing since 1971. Three hundred fifty-seven bighorn sheep from 9 source populations have been released into the project area. Currently, about 700 bighorn sheep occur in 14 herds. The population has increased in size at an average annual growth rate of 7%. Disease transmitted by livestock and unknown sources has been an important factor limiting population growth. At least 7 disease epidemics have reduced the annual population growth rate by about 40%.

Considerable bighorn sheep habitat, particularly summer range, exists in the Wallowa, Seven Devils, and Blue Mountains portion of the project area. Extensive year round habitat occurs in the low elevation Snake River canyon grasslands. Habitat improvement projects completed to date include development of 44 water sources, pasture cultivation for bighorn sheep, treatment of over 70,000 acres with prescribed and wildfire since 1992, and placement of salt and medication blocks in bighorn sheep herd areas. Interagency noxious weed projects are active and ongoing. Several U.S. Forest Service domestic sheep allotments have been vacated since 1990. Public land domestic sheep allotments currently occur at 5 locations within the project area.

Under the Hells Canyon Initiative, state and federal agencies will increase efforts to reintroduce bighorn sheep and manage habitat and populations to establish new herds and increase the size of existing herds. Information on bighorn sheep ecology and factors limiting population size will be collected, evaluated, and incorporated into management. The area will serve as a model for bighorn sheep restoration at a landscape level and provide information and techniques for use in bighorn sheep restoration and management in other areas.

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# I. PROJECT GOALS

## Introduction

The Hells Canyon Initiative is a long term project to restore Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) to the Hells Canyon area in Oregon, Idaho, and Washington. This project represents a partnership among agencies and organizations with jurisdiction over and interest in the land and wildlife in Hells Canyon and the surrounding area. This plan will be administered through a Memorandum of Agreement, formalizing the cooperation between the state wildlife agencies, the U.S. Forest Service, the Bureau of Land Management, and the Foundation for North American Wild Sheep. The Memorandum of Agreement covers the portion of the project area within the Pacific Northwest Region (Region 6) of the U.S. Forest Service.

## Goal

The goal of the Hells Canyon Initiative is to: **restore self-sustaining bighorn sheep herds to suitable habitat in the Hells Canyon area**. This project will be a model for bighorn sheep restoration and offer the opportunity to test techniques and address hypotheses about factors that currently affect or limit bighorn herds and success of reintroductions.

## Objectives

Specific objectives to be accomplished in this project are:

1. Implement habitat and population management measures to increase bighorn sheep population size and maintain or increase growth rates.
2. Identify factors limiting bighorn sheep population growth.
3. Identify causes of bighorn sheep die-offs.
4. Implement a population monitoring program to assess progress towards the project goal.
5. Adapt management to reflect monitoring and research data.

## Project area

The Hells Canyon Project area encompasses 2,273,194 ha (5,617,062 ac) in the Snake River drainage in Idaho, Oregon, and Washington from the mouth of Clearwater River, Idaho south to Brownlee Reservoir. It is bounded on the east by the Salmon River drainage, near Riggins, Idaho and extends just west of the Eagle Cap Wilderness, Wallowa-Whitman National Forest, Oregon (Fig. 1). Major drainages include the Snake, Grande Ronde, Imnaha, and lower Salmon rivers. There are currently 14 bighorn sheep herds established in the project area (Table 1).

# II. BACKGROUND

## Reintroductions

Bighorn sheep were extirpated from Hells Canyon and the adjacent Wallowa Mountains by 1945 (Smith 1954, Johnson 1980, ODFW 1992). As elsewhere in the western United States this was probably due to a combination of competition with livestock for forage, diseases introduced by domestic sheep, and over hunting. The first reintroductions of bighorn sheep to Hells Canyon and the surrounding area occurred in 1971 when the Oregon Department of Fish and Wildlife (ODFW) translocated 20 Rocky Mountain bighorn sheep from Jasper National Park, Alberta to the Black Mountain area near Hells Canyon Dam and 20 to the Lostine River in the Wallowa Mountains (ODFW 1992). Since 1971, 357 Rocky Mountain bighorn sheep have been translocated into the Hells Canyon area and 94 bighorn sheep have been relocated within the project area (Table 2). Bighorn sheep currently in Hells Canyon originated from 9 sources: Waterton Lakes, Alberta; Jasper National Park, Alberta; Cardinal River, Alberta; Salmon River, Idaho; Wildhorse Island, Montana; Thompson Falls, Montana; Sun River, Montana; Tarryall, Colorado; and Whiskey Basin, Wyoming. Sheep from 2 or more source populations have been released into all herds except Redbird (Table 3).

## Herd history and die-offs

The Hells Canyon bighorn sheep population (or metapopulation) is composed of 14 ewe herds (Figs. 1 and 2). Reintroductions have established 10 herds; 4 herds were established by dispersal, presumably from adjacent herd areas.

Disease has had a significant impact on Hells Canyon bighorn sheep herds. This has been primarily linked to transfer from domestic livestock. However, disease can also be a symptom of other environmental factors, including suboptimal habitat quality (for instance due to fire suppression, noxious weeds, overgrazing by livestock, or inter- or intraspecific competition), and loss of traditional movement patterns, which concentrates bighorns rather than distributing use over available habitat (Risenhoover et al. 1988). Mixing source populations of transplanted bighorns with potentially differential vulnerability to pathogens may also precipitate die-offs (Sandoval et al. 1987).

Seven population die-offs have been reported in the project area since reintroductions were initiated. Die-offs occurred in 1971-72, 1983-84, and 1991 in Upper Hells Canyon; 1986-87 in Lostine; 1988 in Mountain View; and 1995-96 in Lower Hells Canyon and Black Butte. Five die-offs have been linked circumstantially to domestic sheep (Coggins 1988, and unpubl. reports), 1 circumstantially to a feral goat (Cassirer et al. 1996), and 1 to drought and scabies (*Psoroptes ovis*) (Foreyt et al. 1990).

Little information was collected during most early die-offs and most of it after the fact, when numerous dead bighorn sheep were observed by agency personnel, or reported by the public. Pneumonia was the eventual cause of death in all cases where a cause of death could be identified (1984, 1986-87, 1988, and 1995-96 die-offs) however the factors that

started or predisposed the sheep to the die-offs could not be confirmed. Bighorn sheep released at Black Mountain, Oregon in 1971 had disappeared by 1973. Contact with domestic sheep was observed during this period and was suspected to be the cause for the die-off (ODFW 1992). In 1983, most of a population of about 15 bighorn sheep in the Sand Creek area disappeared and presumably died. The cause of the population decline was not determined. Sixty percent of the bighorn sheep across the Snake River in the Granite-Three Creeks area, Idaho also died in 1983 and 1984. Some bighorns were sampled, and *Pasteurella*-associated pneumonia was identified as the cause of this die-off. Parainfluenza-3, epizootic hemorrhagic disease, and chlamydia were also detected. Domestic sheep were thought to be the source of the pathogens (McNeill et al. 1987). Bighorn sheep populations have not recovered in either the Black Mountain or Granite Creek areas, despite total releases of 103 sheep including the most recent release of 30 bighorn sheep to Granite Creek by Idaho in 1990. Most bighorn sheep from this release died in 1991, apparently due to contact with domestic sheep.

From November 1986 through March 1987, an estimated two-thirds of the 110 bighorn sheep in the Lostine herd in Oregon died from bacterial pneumonia attributed to contact with domestic sheep (Coggins 1988, ODFW 1992). This population has since recovered and is now estimated at 80 bighorns. In 1988, about two-thirds of the California bighorn sheep (*O. c. californiana*) died at Cottonwood Creek on the Grande Ronde River, Washington. The sheep apparently died from a combination of poor range conditions due to drought and infection by scabies parasites introduced during a transplant of Rocky Mountain bighorn sheep from Idaho. Although both Rocky Mountain and California bighorn sheep were exposed to the scabies, it appeared to be lethal only to the California bighorn sheep (Foreyt et al. 1990).

The most recent Hells Canyon disease episode occurred in the winter of 1995-96. A population die-off believed to have started near 10-mile Creek, Washington extended 40 miles to the Imnaha River, Oregon. About 235 bighorns died from bacterial pneumonia, most in the Black Butte and Lower Hells Canyon, Oregon herds. Sheep in the Wenaha, Joseph Creek, Mountain View/Lost Prairie, Redbird, and Lower Hells Canyon, Idaho herds were also affected to varying degrees (Cassirer et al. 1996).

## Current population status and dynamics

As of 1996, there were approximately 700 bighorn sheep in the 14 Hells Canyon project area herds (Fig. 1, Table 1). Movements have been documented among many of the herds, often during the rut.

Average annual growth rate for all herds, including die-off periods in 5 herds that have experienced them, is 7%. This includes growth due to both production and immigration. Average annual growth rate in the absence of die-offs was 12%. The highest average growth rates were 22% in Lower Hells Canyon and 18% in the Black Butte herd prior to the 1995-96 die-off and 22% at Sheep Mountain (Table 5). Herd growth rates were higher during the 2nd - 4th years after bighorns were released into vacant habitat than subsequently (Table 5). Average herd growth rates were not significantly correlated to total

number of bighorns released (mean = 28, range 16-58, r=-0.13, p=0.7, n=9). Growth rates were negatively correlated with population size in herds with more than 4 years of data where effects of die-offs could be eliminated (Figure 4).

Average lamb:ewe ratios in Hells Canyon herds are 41 lambs:100 ewes, and range from an average of 14 lambs:100 ewes in the Upper Hells Canyon, Idaho herd to 76 lambs:100 ewes at Sheep Mountain. Other herds with relatively high average lamb:ewe ratios are Bear Creek, the Imnaha, and Black Butte. Herd lamb:ewe ratios are not correlated to average annual growth rate (r=-0.08, p=0.8, n=10). This may be because lamb:ewe ratios were estimated at different times of years for different herds and may not be comparable among herds. Ram:ewe ratios average 52:100 and are highest in the Joseph Creek and Bear Creek herds (Table 5).

Five herds are at or below the number of bighorn sheep released into them. These are the Asotin; Lower Hells Canyon, Oregon; Upper Hells Canyon, Oregon; Upper Hells Canyon, Idaho; and Bear Creek, Oregon herds. The declines in these herds are primarily due to disease-related die-offs, movements of sheep away from release sites into other herds (Coggins and Matthews 1996), or to low numbers of bighorns released (Asotin).

If the current population trend continues, the Hells Canyon bighorn sheep metapopulation will continue to increase at approximately 7% annually. Overall numbers would double in about 10 years ($0.6931/\log_e 1.07$, Caughley 1977:52) with some herds likely experiencing die-offs or disappearing, and other herds increasing in size.

**Harvest**

Nearly 200 bighorns have been harvested in the project area since the first hunt in 1976 (Table 4). Harvest in all states is by controlled permit and limited to rams. Success rates are 80 - 90%. Idaho requires rams have a 3/4 curl or greater or be at least 4 years old; Oregon and Washington permit the taking of any ram. Minimum herd size for a hunt is 60 bighorns in Oregon, 100 bighorns in Idaho, and 30 adult bighorns with population stable or increasing in Washington. Washington herds must have at least 8 mature rams of which 2 are at least 6 years old or 3/4 curl. In Idaho, permits can be issued for no more than 20% of mature rams (3/4 curl or greater). In Washington permits are limited to 20% of mature rams when ram:ewe ratio > 50:100, 15% of mature rams when ram:ewe ratio = 25-50:100, and 10% of mature rams when ram:ewe ratios < 25:100. There are also additional herd-specific criteria in Washington. Each state has an auction tag and a lottery tag. These tags can be used in any open unit (IDFG 1991, ODFW 1992, WDFW 1995).

**Habitat availability**

Extent of bighorn sheep habitat in the Hells Canyon project area was evaluated using a Geographic Information System and a predictive model based on habitat models used in Utah, Montana, New Mexico, and Washington and throughout the western U.S. (Smith et al. 1991, Dunn 1993, Johnson and Ringo 1995, Gudorf and Sweanor 1996, Schirokauer 1996)

(Tables 7 and 8). Vegetation information was obtained from a supervised classification of TM satellite imagery. Satellite imagery was not available in this form for classification of the northwestern corner of the project area (including most of the Wenaha and Asotin herds) and these areas were omitted from habitat analysis. Slope and elevation information was obtained from USGS 1:24,000 digital elevation models for all areas where available. Digital elevation models at a scale of 1:100,000 were patched in for the Rattlesnake Ridge, Idaho and Silcott Island, Washington topographic quads. Water availability was obtained from USGS 1:100,000 hydrography. Information on land ownership and domestic sheep allotments on public land were obtained from the U.S. Forest Service and BLM Upper Columbia Basin Project and local agency sources.

Suitable bighorn sheep habitat is steep, with high visibility, in proximity to free water, and winter range must be relatively snow-free. All areas at least 1.6 ha in size with slopes of 31° - 85° ("escape terrain") and areas within 300m of escape terrain or bordered on 2 sides within 500m of escape terrain were initially selected by the model. Areas with dense forest or shrub vegetation and areas greater than 3.2 km from water were then eliminated.

Approximately 541,221 ha (1,337,356 ac) of suitable bighorn sheep habitat was predicted to occur within the analysis area. Approximately 68% of potential habitat is publicly-owned, primarily managed by the U.S. Forest Service. Approximately 60% of 427,189 ha (1,085,060 ac) of predicted winter range and 78% of 105,451 ha (260,570 ac) of predicted lambing habitat is in public ownership (Table 9). Privately-owned bighorn sheep habitat is concentrated in several areas: along the Snake River in Washington from the Oregon border north, along the Grande Ronde and Joseph Creek drainages in Oregon and Washington, in the Imnaha River drainage in Oregon, along the Snake River south of the Salmon River in Idaho, and along the lower Salmon River. Private inholdings also occur within publicly-owned areas.

**Habitat limitations**

Slope was the primary factor determining the extent of potential bighorn sheep habitat within the project area. Extensive grasslands are available, and overall, forest succession did not seem to be a major determinant of the amount of habitat available, although it may affect individual herds. Winter range is limited at the higher elevations of the Wallowa and Seven Devils Mountains but is extensive within the Snake River portion of the project area. Less than 1% of potential habitat was eliminated because of lack of water even though natural and developed springs were not included. Three of the areas eliminated due to distance from water were on public land: Wapshilla Ridge at Craig Mountain, Joseph Creek Wildlife Management Area south of Joseph Creek, and the lower Imnaha drainage (Fig. 2). Spring development projects have been conducted or are planned in the vicinity of these areas (Table 10).

Extent of habitat does not appear to currently limit the number of bighorn sheep. Much suitable habitat is currently unoccupied by bighorn sheep. However, habitat quality, including factors such as forage species composition and nutritional value were not measured in this analysis and may affect herd size, productivity, and distribution. For example,

noxious weeds in general and Yellow Starthistle (*Centaurea soltistalis*) in particular are invading the Hells Canyon grasslands and may affect bighorn sheep habitat quality.

**Livestock**

Historically, contact with domestic sheep is believed to have contributed to bighorn sheep die-offs and limited the Hells Canyon bighorn sheep population (Martin et al. 1996). The number and extent of domestic sheep grazing in the project area has declined considerably in the last 25 years. There are currently 3 active domestic sheep grazing allotment areas on U.S. Forest Service land within the project area. The Mud Duck allotment is located in bighorn sheep habitat in the Wallowa Mountains between the Lostine and Upper Hells Canyon herds and administered by the Wallowa-Whitman National Forest. The Mud Duck outside the Hells Canyon National Recreation Area (HCNRA) was previously combined with the Mud Duck and Temperance-Snake allotments within the HCNRA. These allotments were terminated in October 1996 (USFS 1995). The Mud Duck allotment outside HCNRA provides summer grazing only.

The Curren Hill, Echols Butte, Deep Creek and other contiguous allotments in bighorn sheep habitat are administered primarily by the Payette National Forest in the southeastern part of the project area nearest the upper Hells Canyon, Idaho bighorn herd. Most of these allotments are not covered under the Hells Canyon Initiative Memorandum of Understanding. They are currently active and are expected to remain so in the near future.

The Mud Creek allotment is administered by the Wallowa-Whitman National Forest and is southeast of the Upper Joseph Creek bighorn herd. This allotment is adjacent to private land and contains little suitable bighorn sheep habitat.

The Bureau of Land Management administers 2 grazing allotments along the Little Salmon River in Idaho and 3 grazing allotments near the Powder River and tributaries in Oregon. These allotments are intermingled with private land and are not in suitable bighorn sheep habitat.

Domestic sheep are also grazed on private land in suitable bighorn sheep habitat. These areas are concentrated in the north end of the project area in the Snake River drainage from Lewiston, Idaho and Asotin, Washington south; in the Grande Ronde River drainage; and in the Imnaha and Salmon River drainages. Private flocks are relatively small, ranging from a single sheep to several hundred.

A dwindling herd of feral goats on privately-owned bighorn sheep habitat north of the Redbird herd since the 1960s was eliminated in 1995 when the remaining goats were captured and transferred to captivity. A single feral goat has been reported in Kurry Creek above Pittsburgh landing. There are currently no restrictions or monitoring of pack goat use in the project area.